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nian and Turonian divisions of Europe. The third sub-flora is that of the Belly river at the base of the Fort Pierre group. Though separated from the Laramie by the Pierre and Fox hill groups, it introduces the Laramie or Dominion flora, which continues to the top of the Cretaceous, and probably into the Eocene, and includes several species still surviving in America. Next comes the Laramie group itself, the fossils of which are found in Canada, chiefly in the lower and upper beds, the middle beds being poor in plants. Sir W. Dawson concludes that no cause for the mild temperature of the Cretaceous other than change of elevation need be invoked.

Tertiary.—According to Woodward, fifteen species of fossil sirenians have been referred to Halitherium, while two considerably larger species, both found in Italy, are placed in Felsinotherium, and closely resemble Halicore in dentition. *Prorastomus sirenoides* Owen, from Jamaica, differs widely from all other sirenians, but is nearer Manatus than Halicore. The dental formula is $i\,\frac{3-3}{3\ 3}$ $c.\,\frac{1-1}{1-1}$ $p.\,m.\,\frac{5-5}{5-5}$ $m.\,\frac{3\ 3}{3\ 3} = 48$. Felsinotherium has $i\,\frac{1\ 1}{0\ 0}$ $m.\,\frac{5-5}{5-5}$. An interesting discovery was a cast of the interior of the skull of *Eotherium ægyptiacum* at Mokattam, near Cairo, in 1875. The brain of the huge Rhytina is only one-sixth of the size of that of the manatee or dugong. The total number of extinct sirenians enumerated by Woodward, including Chirotherium from Piedmont; Chronozoön from New South Wales; Crassitherium from Belgium; Dioplotherium and Hemicaulodon from South Carolina and New Jersey; Pachyacanthus from near Vienna; Rhytiodus and Trachytherium from France, and two extinct Manati, is twenty-eight. The recent species are three of Manatus and three of Halicore. Dr. Murie believes that the large number of fossil species described will probably have to be reduced into two or three genera.

MINERALOGY AND PETROGRAPHY.[1]

ETCHED FIGURES. — Under this general head are included etched figures proper (Aetz-Figuren of the Germans) and figures produced by weathering (Verwitterungs-Figuren). These were first studied, as early as 1816, by Daniell.[2] A little later, Leydolt[3] investigated the forms of the depressions on rough surfaces of crystals. Pape[4] next took up the subject. He drove off the water contained in many minerals and examined the shape of the figures resulting (Verstäubungs-Figuren). In later years, many other investigators have attempted to discover the relations between etched figures, those produced by weathering and the directions of cohesion in minerals. Baumhauer succeeded in proving that the shapes of etched figures were independent of the cleavage planes, but were intimately related to the symmetry of the crystal, and thus opened up a new method of investigating opaque minerals. In order to study more closely the connection between the figures produced by weathering and those produced by etching, Blasius,[1] of Strassburg, subjected a number of substances in crystal form to the action of alcohol, and also placed them in desiccators with strong sulphuric acid. As the result of a large number of experiments, he concludes that many of the figures produced by weathering (including etched figures) cannot be brought into close relation with the directions of cleavage or the curves of hardness in the substances acted upon. Moreover, their shapes differ according to conditions, and, finally, from a knowledge of the etched figures on a number of faces the shape of those on others can be deduced. F. Becke[2] adds further to our knowledge in an article on the etched figures of minerals of the magnetite group. Magnetite, spinel, franklinite and linnæite were treated with sulphuric, nitric and hydrochloric acids of different concentrations and during periods of different lengths, and besides with alkaline solutions. 1. On all the crystal faces, the figures were composed essentially of the same planes of etching, the principal planes of etching. 2. The principal planes of etching lie in a determinate zone. 3. These planes of etching offer the greatest opposition to the action of solvents. 4. Depressions are formed on such faces as belong to the zone of etching, elevations on those which lie far without it. 5. Cleavage planes cannot, at the same time, be planes of etching. 6. Linnæite, when etched with acids, deports itself like magnetite; when treated with alkaline solutions, an entirely different plane becomes the principal plane of etching. Consequently, it may be assumed that "the elemental atoms in the crystal molecule maintain a definite position with relation to one another." In linnæite (Co_3S_4), for instance, "the cobalt atoms are turned toward the cubic faces and the sulphur atoms toward the dodecahedral faces," because when treated with acid the cubic faces are dissolved fastest, but when treated with fused potash, the dodecahedral faces offer the least opposition to the solvent action of this reagent. Baumhauer[3] makes practical use of the method of etched figures in an investigation of the character of the massive bornite from Chloride, N. M. When a polished surface of this mineral is treated with nitric acid it breaks up into several fields, each of which reflects the light differently, showing that the massive material is made up of an irregular intergrowth of individual crystals. At the same time the fact is brought out that twinned inclusions of chalcocite and chalcopyrite are not uncommon.

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[1] Edited by W. S. BAYLEY, Johns Hopkins University, Baltimore, Md.

[2] Quart. Jour. Sci., I, 1816, p. 24.

[3] Sitz.-Ber. der Akad., Wien, 1855, 15, p. 59.

[4] Poggendorf's Annalen, 124, p. 329, etc.

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[1] Zeits. für Kryst. und Miner., X, p. 221.

[2] Min. und Petrogr. Mitt., VII, p. 195.

[3] Zeitschrift für Krystallographie, X, p. 447.

ANDESITE.—The question of the best definition of andesite is again discussed by J. Siemiradzki[1] in an article on the rocks of Ecuador. Von Buch described it as a volcanic rock consisting of plagioclase and hornblende; and Lagorio as a volcanic rock composed of plagioclase, with the addition of augite, hornblende or mica. Rosenbusch[2] separates the mica and amphibole andesites from the augite andesite. Siemiradski finds that the same lava-stream varies in acidity, and that, though hornblende is more abundant in the more acid andesites, on the other hand augite and even olivine occur in very acid varieties, containing free silica, while hornblende is entirely lacking.[3] "No indication of the regular sequence of separation of augite, hornblende and mica with increasing acidity, as observed by Hague and Iddings,[4] can be detected." He suggests as the best definition of this class of rocks the following: Neutral or acid plagioclase rocks, with at least fifty-five per cent of SiO_2, with trachytic, basaltic or phonolitic habit, consisting of porphyritic andesine, with an iron-rich pyroxene, hornblende or mica in a groundmass, composed essentially of an acid andesine or oligoclase, and an acid glass (mixture of oligoclase substance and amorphous silica) containing microscopic pyroxene.

The porphyritic hornblende of these Ecuador andesites is surrounded by an opacitic rim and contains inclusions of the groundmass, which, under the microscope, are seen to consist of feldspar and augite microlites. Moreover, it is not confined to the most acid varieties. Consequently, the author suggests that it may have been produced, at great depths, in a magma saturated with superheated steam under great pressure, while the augite crystallized from a dry magma under comparatively little pressure—a theory very different from the one usually accepted.

WILDSCHONAU GABBRO.—In a communication on this subject, Cathrein[5] calls attention to the article of Hatch, already noticed in these notes.[6] He claims that the latter's hornblende-gabbro and amphibolite are chlorite-gabbro and chlorite-schist, and that there are no proofs of the close relation which that author supposes to exist between normal gabbro and serpentine on the one hand and amphibolite and epidote rock on the other.

PETROGRAPHICAL NEWS.—F. Becke[7] communicates a few notes on the rocks of the lower Austrian Waldviertel. At Marburg there occurs a granophyre in veins. It consists of zircon in small yellow grains, chloritized biotite, dark-green hornblende, clear transparent orthoclase and microcline and opaque altered plagioclase in a groundmass of small brown plates of biotite and clear orthoclase and quartz in micropegmatitic growths. Pilite-kersantite from Spitz on the Donau and pyroxene-amphibolite from Aschauer are also described. In the same article Becke reports the result of a reinvestigation of Schrauf's kelyphite,[1] the alteration product of pyrope in olivine rocks. This substance, he thinks, is a mixture of a chrome-spinel and a silicate, probably hornblende. The reaction of the olivine on the garnet he represents thus:

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[1] Geologische Reisenotizen aus Ecuador, N. J. B. Beil., Bd. IV, 1885, p. 195.

[2] Mikros. Phys. der Massigen Gesteine, 1877.

[3] Lagorio, Andesite des Kaukasus, p. 27.

[4] Notes of the volcanic rocks of the Great Basin. Amer. Jour. Sci., XXVII, 1884, No. 162.

[5] Miner. und Petrog. Mitth., VII, p. 189.

[6] NATURALIST, October, 1885, p. 992.

[7] Min. und Petrog. Mittheilungen, VII, p. 250.

$$\underset{\text{pyrope,}}{Mg_3Al_2Si_3O_{12}} + \underset{\text{olivine,}}{Mg_2SiO_4} = \underset{\text{spinel,}}{Al_2MgO_4} + \underset{\text{amphibole.}}{Mg_4Si_4O_{12}}$$

——In a letter to the Neues Jahrbuch,[2] F. H. Hatch describes hypersthene andesite from Mt. Chachani, in Peru.——Inclusions of mica-schist, marble and syenite are mentioned[3] by Hussak as occurring in the phonolite of Oberschaffhausen.——The same writer[4] denies the widespread existence of cordierite in Hungarian andesites, but finds it in many trachytes.——Kolenko[5] mentions hornblende pseudomorphs after olivine as characteristic of a metamorphosed olivine diabase from the north shore of Lake Onega, in the Caucasus. The olivine substance is entirely changed into aggregates and crystals of a non-pleochroic hornblende.——Cathrein[6] communicates an interesting paper on the alteration of garnet in the amphibolites of the Tyrolese Central Alps. Pseudomorphs of epidote, scapolite, oligoclase, hornblende, saussurite and chlorite are described in detail. The scapolite substance is intimately mixed with epidote and plagioclase, and the whole is surrounded by a rim of hornblende crystals. In the change to hornblende, crystals of magnetite separate and the excess of silica, magnesia and lime unite to form epidote.

MISCELLANEOUS.—In a discussion concerning the conduct of the zeolites with reference to their water constituent, C. Bodewig[8] shows that the loss of weight which phacolite suffers over $CaCl_2$ must be due to loss of water of crystallization and not to loss of hygroscopic water. He also contests the idea of Jannasch[9] that every desiccating agent abstracts a certain definite amount of water from these minerals and consequently *some* of the loss over $CaCl_2$ may be due to loss of water of combination.——The twelfth edition

[1] Ueber Kelyphite. Neues Jahrb. f. Miner., etc., 1884, II, p. 21.

[2] Band II, p. 73, 1885.

[3] Neues Jahrb. f. Mineralogie, 1885, II, p. 78.

[4] Ib., p. 81.

[5] Ib., p. 90.

[6] Zeitschrift f. Krystallographie, X, p. 433.

[7] Miner. und Petrog. Mittheilungen, VII, p. 250.

[8] Zeitschrift für Krystallographie, X, p. 276.

[9] Ib., VIII, p. 429.

of Naumann's "Elemente der Mineralogie"[1] has just appeared. The work has been newly revised and brought up to date by Dr. Ferdinand Zirkel, who has undertaken this duty since the death of Naumann in 1873. The new edition contains about fifty pages and thirty-three wood-cuts, more than the eleventh (1881). The chemical formulæ used have all been recalculated and the recent advances in the field of optical and physical mineralogy have been incorporated in the body of the work, so that the new book is the most complete and satisfactory treatise on general mineralogy published in any language.——An abstract from the forthcoming "Mineral Resources of the United States, Calendar Years 1883 and 1884," has just been received. It is entitled "Precious Stones."[2] The author is G. F. Kuntz. The paper treats of the production of precious stones in the United States in 1883 and 1884 and their importation. The total value of precious stones found during 1884 was $82,975, including $800 worth of diamonds. The gold quartz sold as specimens during this year is valued at $40,000, and that cut for gems or ornamental uses at $100,000. The value of the importations is estimated at $9,253,376. The most important finds during the year were as follows: At Auburn, Me., colorless, pink, blue and golden tourmalines to the value of $1500, and at Mt. Mica, in the same State, tourmalines, beryls and aquamarines to the amount of $4145. At Florissant, Cal., about $1000 worth of topaz was taken out. The reports in the newspapers of remarkable finds have all been investigated and have proven to be unreliable. The great "Georgia Marvel" or "Blue Ridge Sapphire," for instance, which was supposed to be a sapphire worth $50,000, turned out to be nothing but a "piece of rolled blue bottle-glass." The paper is interesting as showing just how far we can rely upon our own resources to supply us with ornamental stones. The author also mentions several uses to which domestic material can be applied with fine effect.

BOTANY.[3]

CAN VARIETIES OF APPLES BE DISTINGUISHED BY THEIR FLOWERS.—To a botanist this may seem like a queer question, capable only of an answer in the affirmative, but pomologists have quite universally held to the opposite view. Quotations, like the following, could be made from our most eminent writers of pomological books:

"Peaches are partially classified by the size and color of the petals, but in all the other fruits, as in apples, pears, plums, cherries, etc., the flowers vary but slightly in form and color."

Another says: "Little difference exists in the flowers."

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[1] Elemente der Mineralogie. 951 ills., 782 pp., Leipzig, Wilhelm Engelmann.

[2] Washington, Government Printing Office, 1885.

[3] Edited by Professor CHARLES E. BESSEY, Lincoln, Nebraska.